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Z \rightarrow ψ $l+l^-$ decays in CMS

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The observation is presented of the Z boson rare decay to a ψ meson and two oppositely charged same-flavor leptons, $l+l^-$, where ψ represents the sum of J/ψ and $\psi(2S) \rightarrow J/\psi X$, and $l = \mu, e$, is presented. The data sample of proton-proton collisions at a center-of-mass energy of 13 TeV corresponds to an integrated luminosity of 35.9fb^{-1} accumulated by the CMS experiment at the CERN LHC. The signal is observed with a significance in excess of 5 standard deviations. Removing contributions from $\psi(2S)$ decays to J/ψ , the signal is interpreted as being entirely from $Z \rightarrow J/\psi l+l^-$, with its fiducial branching fraction relative to that of the decay $Z \rightarrow \mu+\mu-\mu+\mu^-$ measured to be

$$B(Z \rightarrow J/\psi l+l^-)/B(Z \rightarrow \mu+\mu-\mu+\mu^-) = 0.70 \pm 0.18 \text{ (stat)} \pm 0.05 \text{ (syst)}$$

This result is obtained with the assumption of no J/ψ polarization. Extreme polarization scenarios give a variation of the fiducial branching fraction measurement of $(-22 \text{ to } +24)\%$.

Summary

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